REMARKS

This paper is being provided in response to the Final Office Action dated March 21, 2007, for the above-referenced application. In this response, Applicants have amended claims 1, 10 and 15 to clarify that which Applicants consider to be the claimed invention. Applicants respectfully submit that the amendments to the claims are fully supported by the originally-filed specification, as further discussed below.

As an initial matter, Applicants note that this Office Action has been made final despite being a first action following Applicant's submission of an RCE. The RCE was filed along with instructions to consider the Response to Final Office Action filed by Applicants on January 8, 2007, and was filed following receipt from the Examiner of an Advisory Action that asserted Applicants proposed amendments in the Response "raise new issues that would require further consideration and/or search." Applicants cite specifically to MPEP 706.07(b) that states, in part:

> However, it would not be proper to make final a first Office Action in a continuing or substitute application where that application contains material which was presented in the earlier application after final rejection or closing of prosecution but was *denied entry because (A) new issues were raised that required further consideration and/or search....*
> (emphasis added)

According to the MPEP, the finality of the present Office Action has been improperly assessed, and, indeed, it is not justifiable to require that Applicants file an RCE to have claim amendments considered because they "require further consideration and/or search" but then issue a first action as a Final Office Action rejecting Applicants' amended claims on the same grounds as previously

stated. Accordingly, in view of the above, the finality of the present Office Action must be withdrawn and, thus, the amendments proposed herein are entitled to entry.

The rejection of claims 1, 10 and 15 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,761,705 to DeKoning, et al. (hereinafter "DeKoning") and the rejections of claims 3-9, 12-14 and 17-20 under 35 U.S.C. 103(a) as being unpatentable over DeKoning are hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Independent claim 1, as amended herein, recites a method of handling a faulting memory of a pair of mirrored memories. The method includes initially causing a non-faulting memory of the pair of mirrored memories to service all read and write operations for the pair or mirrored memories. It is determined that the hardware corresponding to the faulting memory of the pair of mirrored memories has been successfully replaced to provide a new memory, wherein the new memory and the non-faulting memory form a new pair of mirrored memories. In response to the new memory being provided, stored data is caused to be copied from the non-faulting memory to the new memory while data is being read from and new data written to the non-faulting memory. In response to a write of the new data being performed to the non-faulting memory at a time while stored data is being copied from the non-faulting memory to the new memory, the write is caused to be performed to the non-faulting memory and the new memory as part of a mirroring operation between the new memory and the non-faulting memory of the new pair of mirrored memories that occurs during at least a portion of the time while the stored data is being copied from the non-faulting memory to the new memory. In response to successfully copying to the

new memory, writes are caused to be performed to both memories of the new pair of mirrored memories and one of the new pair of mirrored memories is selected for read operations when one or more read operations are performed. Claims 3-9 depend directly or indirectly from independent claim 1.

Independent claim 10, as amended herein, recites computer software, provided in a computer-readable medium, that handles a faulting memory of a pair of mirrored memories. The software includes executable code that initially causes a non-faulting memory of the pair of mirrored memories to service all read and write operations for the pair of mirrored memories. Executable code determines that the hardware corresponding to the faulting memory of the pair of mirrored memories has been successfully replaced to provide a new memory, wherein the new memory and the non-faulting memory form a new pair of mirrored memories. Executable code causes stored data to be copied from the non-faulting memory to the new memory while data is being read from and new data written to the non-faulting memory after the new memory is provided. Executable code, that in response to a write of the new data being performed to the non-faulting memory at a time while stored data is being copied from the non-faulting memory to the new memory, causes the write to be performed to the non-faulting memory and the new memory as part of a mirroring operation between the new memory and the non-faulting memory of the new pair of mirrored memories that occurs during at least a portion of the time while the stored data is being copied from the non-faulting memory to the new memory. Executable code causes writes to be performed to both memories of the new pair of mirrored memories and one of the new pair of mirrored memories is selected for read operations when one or more read

operations are performed in response to successful copying to the new memory. Claims 12-14 depend directly or indirectly from independent claim 10.

Independent claim 15, as amended herein, recites a data storage device including a plurality of disk drives, an internal volatile memory and a plurality of directors coupled to the memory. Some of the directors are coupled to the disk drives and some of the directors allow external access to the data storage device. Each of the directors handles a faulting memory of a pair of mirrored memories by initially causing a non-faulting memory of the pair of mirrored memories to service all read and write operations for the pair of mirrored memories. It is determined that the hardware corresponding to the faulting memory of the pair of mirrored memories has been successfully replaced to provide a new memory, wherein the new memory and the non-faulting memory form a new pair of mirrored memories. In response to the new memory being provided, stored data is caused to be copied from the non-faulting memory to the new memory while data is being read from and new data written to the non-faulting memory. In response to a write of the new data being performed to the non-faulting memory at a time while stored data is being copied from the non-faulting memory to the new memory, the write is caused to be performed to the non-faulting memory and the new memory as part of a mirroring operation between the new memory and the non-faulting memory of the new pair of mirrored memories that occurs during at least a portion of the time while the stored data is being copied from the non-faulting memory to the new memory. In response to successfully copying to the new memory, writes are caused to be performed to both memories of the new pair of mirrored memories and one of the new pair of mirrored memories is selected for read operations when one

or more read operations are performed. Claims 17-20 depend directly or indirectly from independent claim 15.

The DeKoning reference discloses methods and structure for maintaining cache consistency in a RAID controller having redundant caches. FIG. 1 of DeKoning shows two redundant disk array controllers (RDAC) 118.1 and 118.2 each having a cache memories 116.1 and 116.2. In dual-active RDAC pair mode, each of the pair of RDACs 118.1 and 118.2 is active in parallel with the other to maintain cache information in its own cache as well as the cache of the alternate RDAC. (See col. 5, lines 38-45 of DeKoning.) If mirrored operation is enabled then the caches 116.1 and 116.2 of the RDACS 118.1 and 118.2 must be synchronized before mirrored operation can begin. (See col. 7, lines 39-41 of DeKoning.) Each RDAC cache memory includes a battery subsystem to maintain the validity of the associated cache memory and includes a sense capability to indicate that the battery subsystem has failed at some time. (See col. 6, lines 47-61 of DeKoning).

The Office Action indicates that it is not clear from DeKoning's disclosure whether a write performed to cache 116.1 while data is being copied to cache 116.2 is also performed to 116.2 immediately or later as part of the background copy operations, but suggested that either alternative fell within Applicants' claims. The Office Action repeatedly cites to the "background copy" operations throughout the action; however, it seems to be recognized in the Office Action that the background copy operations are not mirroring operations. Moreover, it also seems clear that, in view of the statements in DeKoning at col. 7, lines 39-41 stating that for mirrored operation memory caches 116.1 and 116.2 must be synchronized before mirrored operation can

begin, under DeKoning's disclosure a write to cache 116.1 cannot be performed immediately to cache 116.2 while data is being copied to cache 116.2. Indeed, such an immediate write would be a mirroring operation and DeKoning is explicit in stating that the caches must be synchronized first before such mirrored operation can begin.

The Office Action states (beginning on page 8, bottom) that nothing in DeKoning's device precludes a write to the non-faulting memory being written to the new memory as part of the copy operations, further stating that when all copy operations have completed, mirrored operation can begin. The Office Action then characterizes a key feature of DeKoning's device as allowing the host to store new data in cache 116.1 while data previously stored in cache 116.1 is copied to new cache 116.2 At the top of page 10, the Office Action states that Applicant's claims do not require that "new" data be written to memories as part of the mirroring operation.

Applicants have amended the independent claims herein to make it clear that in response a write *of new data* being performed to the non-faulting memory at a time while *stored data* is being copied from the non-faulting memory to the new memory, the write is caused to be performed to the non-faulting memory and the new memory *as part of a mirroring operation between the new memory and the non-faulting memory of the new pair of mirrored memories that occurs during at least a portion of the time while the stored data is being copied from the non-faulting memory to the new memory.* (See, for example, page 32, lines 3-13 of Applicants' originally-filed specification.) Thus, while the Office Action concludes that DeKoning's device stores new data in cache 116.1 while data previously stored in cache 116.1 is copied to cache 116.2; Applicant has made it clear in the presently-claimed invention that Applicants recite a

system that allows new data to be written to the non-faulting memory and the new memory as part of a mirroring operation at a time while data previously stored in the non-faulting memory is being copied to the new memory.

Accordingly, Applicants respectfully submit that DeKoning does not teach or fairly suggest at least the features of handling a faulting memory of a pair of mirrored memories, wherein in response to a write of the new data being performed to the non-faulting memory at a time while the stored data is being copied from the non-faulting memory to the new memory, causing the write to be performed to the non-faulting memory and the new memory as part of a mirroring operation between the new memory and the non-faulting memory of the new pair of mirrored memories that occurs during at least a portion of the time while the stored data is being copied from the non-faulting memory to the new memory, as claimed by Applicants. In view of the above, Applicants respectfully request that the rejections be reconsidered and withdrawn.

Based on the above, applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 508-898-8603.

Respectfully submitted,
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